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<b>(21) International Application Number:</b> PCT/NO90/00145 <b>(22) International Filing Date:</b> 24 September 1990 (24.09.90)  <b>(30) Priority data:</b> 893904 2 October 1989 (02.10.89) NO  <b>(71) Applicant (for all designated States except US):</b> POLLUTION CONTROL A/S [NO/NO]; Tomteveien 34, N-1600 Fredrikstad (NO).  <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only) :</b> PETTERØE, Tor, Anders [NO/NO]; Lineveien 7, N-1650 Sellebakk (NO). FINSRUD, Svein [NO/NO]; Slevik Platå 105, N-1620 Gressvik (NO). ERIKSEN, Dag [NO/NO]; Rød Asma-løy, N-1674 Vesterøy (NO). ERIKSEN, Geir [NO/NO]; Idavollen 6, N-1650 Sellebakk (NO).		<b>(74) Agent:</b> VADLA, Tormod; Vadlas Patentbureau, Postboks 853, N-1601 Fredrikstad (NO).  <b>(81) Designated States:</b> AT (European patent), BE (European patent), CA, CH (European patent), DE (European patent)*, DK (European patent), ES (European patent), FR (European patent), GB (European patent), IT (European patent), LU (European patent), NL (European patent), SE (European patent), US.  <b>Published</b> <i>With international search report.</i>
<b>(54) Title:</b> A METHOD FOR DETERMINING THE CONTENT OF ORGANIC POLLUTION IN A LIQUID AND/OR GASEOUS MEDIUM  <b>(57) Abstract</b>  The content of organic pollutions of a liquid and/or gaseous medium is determined by the aid of a method consisting of contacting said medium with ozone gas, and measuring the CO <sub>2</sub> gas which is consequently formed. The process may be fully automatized.		

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A method for determining the content of organic pollution in  
a liquid and/or gaseous medium

5 The present invention relates to a method for determining  
the content of oxidizable organic compounds or substances  
which are dissolved, mixed or dispersed in a liquid and/or  
gaseous medium.

10 In order to determine, e.g. the amount of chemically  
oxidizable organic substances in water substantially two  
basically different methods are used. One method comprises  
titration of the sample solution with a standard solution  
consisting of potassium permanganate or potassium  
15 dichromate. Disadvantages of said methods of titration are  
that inorganic substances are oxidized at the same time,  
and that said methods require a certain time and not  
insignificant labor at a lab. Another method which was  
recently introduced consists of making a sample the object  
20 of a combustion reaction at higher temperatures, and  
measuring or determining the quantity of the combustion  
product CO<sub>2</sub>. The quantity of CO<sub>2</sub> will, thus, provide an  
expression of the quantity of organic material of the  
sample. Disadvantages of the last mentioned method are that  
it requires very expensive apparatus, and an all-automatic  
25 and continuous analysis is rendered difficult by the the  
combustion process proper.

It was an object of the present invention to provide a  
method which eliminates the above disadvantages connected  
30 with known technology. Furthermore, it was an object to  
achieve a simple and dependable method which may be  
automatized, and which permits continuous measuring and  
detection of organic material, e.g. in effluent from a  
factory, a municipal sewer, or the like.

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According to the present invention the above objects are  
achieved by a method which is substantially characterized by  
the fact that a gaseous and/or liquid medium is contacted

with ozone gas, and that the carbon dioxide gas thus formed is subjected to measurements and calculations, so that its content of organic material may be determined. Further characterizing features of the method will appear from the following dependent claims.

The method is illustrated below with reference to a drawing figure by the aid of an example of an embodiment of the method.

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The liquid to be examined flows through pipeline 1. A magnetic volumeter 2 measures the rate of liquid flow, and suitable measuring signals are transmitted to a microprocessor 4. From pipeline 1 a sample is taken through pipe branch 7 and magnet valve 8 to sample chamber 6. From an ozone container 9 ozone gas is added to sample chamber 6, via a conduit 10, and a magnet valve 11, sample chamber 6 now being filled with liquid through which finely dispersed ozone gas passes. "Cold combustion" of organic material will consequently occur in sample chamber 6, and the formed CO<sub>2</sub> gas is conducted to a CO<sub>2</sub> measuring device 3 which will, in turn, transmit suitable signals to microprocessor 5, which will process the received measuring signals and will present them to the user in a suitable manner. In this manner, e.g. quantities of discharged organic material per hour may be read and recorded. Upon a completed analysis of a removed and isolated volume of liquid sample the sample chamber is ventilated by the aid of a ventilating device 12, and the sample chamber 6 is emptied of sample solution through discharge conduit 13 and magnet valve 14. 5 is the output signal unit which may be provided with telefax, alarm, etc. Microprocessor 4, inter alia, controls magnet valves and, consequently, the interval for analyses.

## CLAIMS:

1. A method for determining the content of organic pollutions in a liquid and/or gaseous medium,  
5 c h a r a c t e r i z e d i n that said liquid and/or gaseous medium is contacted with ozone gas, and that the carbon dioxide gas consequently formed is measured.
2. A method as stated in claim 1, c h a r a c t -  
10 e r i z e d i n that from the medium to be analyzed samples are automatically and continuously taken which samples are, likewise in an automatic and continuous manner made an object of ozone treatment and measurement of the quantity of carbon dioxide.
- 15 3. A method as stated in claim 2, c h a r a c t - e r i z e d i n that a microprocessor is used, which processes the incoming data of analysis and the discharged volume of said medium, permitting the quantity of organic  
20 material being discharged during a certain period of time, e.g. 1 hour, to be recorded.



# INTERNATIONAL SEARCH REPORT

International Application No PCT/NO 90/00145

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>6</sup>		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC5: G 01 N 31/00,- 33/18		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>7</sup>		
Classification System	Classification Symbols	
IPC5	G 01 N	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched <sup>8</sup>		
SE,DK,FI,NO classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT<sup>9</sup></b>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	Patent Abstracts of Japan, Vol 8, No 159, P289, abstract of JP 59- 56164, publ 1984-03-31 (FUJI DENKI SOUGOU KENKYUSHO K.K.) --	1-3
X	DE, A1, 3830623 (BBC BROWN BOVERI AG) 3 May 1989, see page 2, line 24 - line 27; claims 1,2 --	1,2
Y	DE, C2, 2603752 (SYBRON CORP) 17 January 1985, see column 2, line 40 - line 52; column 6, line 48 - line 59 --	1
Y	SE, B, 433539 (COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION) 28 May 1984, see claim 1 ----- -----	1
<p><sup>10</sup> Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
3rd January 1991	1991 -01- 08	
International Searching Authority	Signature of Authorized Officer	
SWEDISH PATENT OFFICE	Gunnel Wästerlid Gunnel Wästerlid	

**ANNEX TO THE INTERNATIONAL SEARCH REPORT  
ON INTERNATIONAL PATENT APPLICATION NO.PCT/NO 90/00145**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.  
The members are as contained in the Swedish Patent Office EDP file on **90-11-28**  
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